

Cat 11
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24-159
Phillips Lab 159

1. Title: Weather Modification Using Carbon Black

2 Type Effect: S&T

3. Proposed by: Phillips Laboratory (AFMC), Geophysics Directorate

4. Capability Sought and Uses to Which it Could be Put:

4.1 Increase Precipitation:

- 4.1.1 Muddy dirt roads to decrease tractability.
- 4.1.2 Flood fields and small rivers.
- 4.1.3 Decrease crop comfort level.
- 4.1.4 Decrease tractability by snow or freezing rain when the temperature conditions are right.

4.2 Decrease Precipitation:

- 4.2.1 Dry out roads/fields for improved tractability.
- 4.2.2 Deny fresh water to crops in semi-dry regions.

4.3 Increase Cirrus Cloud Cover:

- 4.3.1 Deny visual satellite or high altitude reconnaissance.
- 4.3.2 Decrease light level for night time operations.

4.4 Dissipate Fog:

- 4.4.1 Uncover targets for visual raids.
- 4.4.2 Provide visual inspection of damage.
- 4.4.3 Provide visual reconnaissance.
- 4.4.4 Open airfields for landing/recovery

5. Technical Description: In the paper "Weather Modification by Carbon Dust Absorption of Solar Energy" Gray et al (Journal of Applied Meteorology, Vol. 15, April 1976, 355-386) showed that observational and modeling information indicated that the solar heating of carbon dust could be deployed on the theater scale (-100-300 km²) to achieve precipitation enhancement, to create cirrus clouds, and to dissipate fog and low clouds. Previous work by this laboratory (1) demonstrated the ability to dissipate fog and low stratus over airfields and (2) employed precipitation enhancement techniques to muddy the Ho Chi Minh trail reducing the flow of supplies from North Vietnam.

6. Risks and Limitations:

- a. Creation of optimum submicron particles: Low
- b. Achieve and maintaining desired horizontal distribution of carbon black: Medium
- c. Opportunities to capitalize on investment militarily: Medium/High
- d. Political implications/health hazards: Medium/Low

7. Project Plan - Major Milestones

- a. Numerical model studies completed 1996
- b. Engineering design of test engine mod. 1997
- c. Ground-based field trials completed 1999
- d. Airborne test and evaluation of prototype completed 2001
- e. Engineering design for airborne carbon block delivery system completed 2003
- f. Operational capability 2004

8. Project Cost by Fiscal Year: (\$M)

	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>
6.1	1.0	1.0	1.0							
6.2			1.5	1.5	1.5	1.5	1.5			
6.3					2.0	2.0	2.0	2.0	2.0	2.0
Total	1.0	1.0	2.5	2.5	3.5	3.5	3.5	2.0	2.0	2.0

Rough estimate of total cost to operational capability: \$23.5M. Life cycle costs have not been estimated.

9. Organization Point of Contact: [REDACTED]